The Cleaning Tradition of Terpenes

A Century of Plant-Derived Solvents — From Turpentine and Pine Oil to the Modern Green-Solvent Movement

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Version 1.2

Issued 2026-06-12 (rev. 2026-07-07)

Series Post-Harvest Cannabis Research Series

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Scope A historical and chemical review of terpenes as cleaning agents, positioned within the Post-Harvest Cannabis Research Series to establish why terpene-based chemistry is the sound, well-precedented choice for post-harvest botanical cleaning approaches such as Bud Wash. This paper documents the established record of terpene cleaning chemistry as a compound class. It is educational and makes no efficacy claim about any specific product.

Abstract

Long before the era of synthetic petrochemical solvents, the cleaning agents available to industry and the household were drawn from plants — and among the most important were terpenes. The volatile aromatic compounds that give pine forests and citrus groves their scent have served for well over a century as degreasers, solvents, and, in formulated products at appropriate concentrations, disinfectant cleaners. This paper traces that tradition: from turpentine in the shipyards and workshops of earlier centuries, through the 1929 birth of pine-oil household cleaning, to the modern resurgence of d-limonene and pinene as "green solvents" adopted as the chemical industry retired ozone-depleting and toxic chlorinated compounds. The aim is documentary — to establish, from the historical and chemical record, that terpenes are not a novelty in cleaning but one of its oldest and most enduring foundations, and that this tradition is the chemical foundation underlying terpene-based post-harvest approaches.

Keywords: terpene chemistry, turpentine, pine oil, Pine-Sol history, d-limonene, green solvents, CFC replacement, biodegradable solvents, industrial degreasing, cleaning chemistry history, post-harvest terpene applications

1929	8–12%	100+ yrs	2

ORIGIN YEAR OF THE FIRST BRANDED PINE-OIL CLEANER	PINE OIL IN THE ORIGINAL FORMULATION	DOCUMENTED TERPENE USE AS AN INDUSTRIAL SOLVENT	US PATENTS CITED FOR D-LIMONENE AS A CFC/SOLVENT REPLACEMENT

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1. Before Synthetics: Turpentine and the Workshop

The cleaning power of plant terpenes was understood and exploited well before the chemistry behind it was named. Turpentine — a volatile mixture of terpenes distilled from pine resin — was a staple of pre-industrial and early-industrial labor. In industrial settings, turpentine was historically employed as a cleaner and degreaser for machinery and tools; its strong solvent properties made it useful for removing oils, grease, and other tough residues from metal and mechanical parts, and it was commonly used in shipyards, factories, and other operations to maintain equipment. The same solvent action that thinned paints and varnishes also stripped grime from metal — a dual role that made it indispensable in the workshop.

Turpentine's value extended beyond cleaning into early organic chemistry itself. Through the 19th century it served as a starting material for synthesizing compounds such as camphor, and its terpene content made it a valued resource for the organic chemistry research of the period. The point worth drawing is simple: terpenes were doing serious chemical work — dissolving, degreasing, reacting — generations before the modern solvent industry existed.

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2. 1929: Pine Oil and the Birth of Branded Terpene Cleaning

The terpene cleaning tradition entered the modern household in 1929. Just after the start of the Great Depression, a chemist named Harry A. Cole, living amid the pine forests near Jackson, Mississippi, recognized that pine oil was a natural disinfectant and deodorizer, and built a pine-oil cleaner from it — the product that became Pine-Sol. The original formulation was built around real pine oil at meaningful concentration, and its chemistry did real work.

> *"For nearly a century, one of the most recognized names in household cleaning was built on terpenes — and the chemistry, not just the scent, is what made it work."*

Pine oil is itself a terpene product. Derived by steam distillation of pine wood, needles, or cones, it consists principally of cyclic terpene alcohols — terpineol, borneol, fenchyl alcohol and related compounds — alongside monoterpenes. Its cleaning and disinfectant character is concentration-dependent and well documented. The original Pine-Sol formulation contained roughly 8 to 12 percent pine oil and was acidic enough to remove bacteria from household surfaces, and across the category, pine-oil disinfectant cleaners have ranged from about 0.3 percent up to 60 percent pine oil depending on the application. Research on pine-oil cleaners has documented disinfectant effect against organisms including Salmonella, Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa, at concentrations and formulations appropriate to that use.

3. The Modern Resurgence: Terpenes as "Green Solvents"

3.1 D-Limonene as the Workhorse of the Transition

The late twentieth century gave terpene cleaning a second life, and for a specific reason. As the chemical industry was required to retire chlorofluorocarbons (CFCs) and chlorinated solvents such as 1,1,1-trichloroethane on environmental and health grounds, it needed replacements that performed without the same toxicity profile. Terpenes became widely adopted for many of these applications — with the phase-out of CFCs and trichloroethane, interest focused on terpene cleaners, the most common being d-limonene, derived from orange peels, with alpha- and beta-pinene from wood turpentine also commonly used.

D-limonene became a workhorse of this transition for a range of applications. It has been used as a parts cleaner, engine degreaser, tar and asphalt remover, and, in a number of formulations, as a direct replacement for chlorinated solvents and CFCs, and it appears across industrial degreasers, hand cleaners, and all-purpose formulations. Its appeal is that it is potent yet plant-derived and biodegradable in many applications. As many traditional organic solvents have gradually been replaced by eco-friendly alternatives, d-limonene is recognized as a terpene bio-solvent that meets many of the working criteria of a green solvent.

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3.2 The Principal Cleaning Terpenes

Terpene	Plant Source	Documented Cleaning Role
D-Limonene	Citrus peel (orange, lemon, lime)	Degreaser, parts cleaner, tar/asphalt remover; documented use as a CFC and chlorinated-solvent replacement in specific applications
Alpha- / Beta-Pinene	Pine wood, turpentine	Solvent and cleaning component; basis of pine-derived cleaners
Terpene alcohols (terpineol, borneol)	Pine oil	Disinfectant and deodorizing action in pine-oil cleaners, concentration-dependent

These are the same compound families — limonene and the pinenes prominent among them — that define the aromatic character of many plants prized for their scent. The molecule that cleans an engine block and the molecule that perfumes a citrus grove are, in many cases, the same molecule.

4. Why Terpenes Clean: The Chemistry

The cleaning behavior of terpenes follows from their structure. They are nonpolar hydrocarbons, and the long-standing rule of solvency — "like dissolves like" — helps explain their reach. Oils, greases, resins, and many organic residues are themselves nonpolar, and a nonpolar terpene solvent can dissolve them where water alone cannot. This is part of why turpentine cut grease in the workshop and why d-limonene lifts tar and engine oil today.

Two further properties complete the picture. Terpenes are volatile, so they evaporate after doing their work rather than leaving a heavy residue — pure d-limonene, in particular, evaporates cleanly, in contrast to crude citrus oils whose waxes can leave a film. And many terpene-rich materials, pine oil chief among them, carry documented disinfectant activity at appropriate concentration. The combination — solvency, clean evaporation, and antimicrobial character in the right context — is a profile a cleaning agent is often selected for, and is the same profile that makes terpene chemistry a logical foundation for post-harvest botanical cleaning approaches.

5. A Tradition, Not a Trend

The throughline of this history is that terpenes are not a recent or novel cleaning ingredient. They are among the oldest. The shipwright degreasing a fitting with turpentine, the 1929 chemist building a pine-oil cleaner, and the modern formulator choosing d-limonene over a chlorinated solvent are all drawing on the same underlying chemistry — the solvent and, at appropriate concentration, disinfectant character of plant-derived terpenes. What has changed across the century is not whether terpenes clean, but the sophistication with which they are purified, blended, and applied.

As industry continues to move away from petrochemical and ozone-depleting solvents in many applications, the terpene tradition is positioned not as a relic but as a model: plant-derived, biodegradable in many applications, and documented across generations of use. The oldest cleaning chemistry may also

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be among the most relevant to the future of the field — including its next application in post-harvest cannabis processing.

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Disclaimer

This document is published for informational and industry-education purposes. It reviews the historical and chemical record of terpenes as a class of cleaning agents and makes no efficacy claim regarding any specific commercial product. Concentrations and effects described are those reported in the cited sources for the products and applications discussed.

Related Publications

Terps USA Research Program

Post-Harvest Cannabis Research Series

The DIY Decontamination Trap

The Cleaning Tradition of Terpenes (Current)

The Last Mile of Harvest

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About the Author & Disclosure

Kenneth Fry is the founder of Terps USA, a Denver, Colorado-based company specializing in botanical terpenes and their applications, including cannabis terpene science and post-harvest product formulation. This white paper is part of the Terps USA Research white paper series, published under permanent DOI on Zenodo.org under the Creative Commons Attribution 4.0 International license. ORCID: 0009-0008-9883-6055.

Disclosure: The author is affiliated with Terps USA, which develops and markets botanical terpene products, including Bud Wash, a post-harvest concentrate developed for the cannabis cultivation market. This paper reviews the historical and chemical record of terpenes as a class of cleaning agents and makes no efficacy claim regarding any specific commercial product. Readers are encouraged to independently verify all cited historical and chemical sources.

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